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Investigating the impact of VAIC on Q and GR

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Abstract

This study attempts to investigate a relationship between Value added intellectual coefficient (VAIC) and Tobin's Q Ratio and Revenue Growth (GR) of the listed companies on Tehran Stock Exchange. The (VAIC) model is used to measure intellectual capital and their components. The time period and place of research is relevant to the companies listed in Tehran Stock Exchange during the years 2007-2012; and 111 companies have been selected from this community as the research sample. The results of this study confirmed that there is a positive and significant relationship between intellectual capital and (GR) but there is not any relationship between intellectual capital and Tobin Q index.

Keywords: Intellectual Capital (IC), Value added intellectual coefficient (VAIC), Tobin's Q (Q), Revenue Growth (GR), Tehran Stock Exchange.

Introduction

The determinants of firm performance are two main research streams. First, the traditional economy is based mainly on the importance of external factors and market in determining the success of firms underlines. Other research is based on the paradigm of behavioral and sociological and organizational factors and their relevance to the environment are as the main factors determining the success of the company. In these intellectual thought, Not pay much attention to the company's competitive position, but better performance of company through use of better resource is achieved.

Due to the increasing importance of intellectual capital in corporations' strategy, process excellence, most of the companies are to find intellectual capital measurement methods and to investigate relation it is with financial performance of company. Thus, organizations and companies to gain sustainable competitive advantage requires identify a conscious and systematically management to their intellectual capital.

This study is seeking to obtain empirical evidence on the relationship between added value of intellectual capital (VAIC) and Tobin's Q Ratio and Revenue Growth (GR) of the Iranian company. That, the Q and GR are indexes of financial performance. This article is structured as follows: Section 2 explains in further detail the objective and scope of this study while section 3 describes the method applied to identify, select and highlight the relevant literature, element of Intellectual Capital and the VAIC. After, research hypotheses, variables and method of their calculation are presented. Section 4, explains the methodology, discussesing and analyzing findings. Section 5, conclusion and research result.

Literature review

Sepehr Dost 2010 in a research titled "investigation of the relationship between intellectual capital and the financial performance of the companies in Tehran stock exchange" investigated the relationship between intellectual capitals and pre- tax benefit, and operational cash flow and added value were as indicators of evaluation of companies listed on Tehran stock exchange from years 2004 to 2006. In this research, in order to investigate the relationship between intellectual, operational cash flow and added value of companies, the exchanged production function form of Cup Douglas and to investigate the efficiency of the cause and effect relationship between dependent and independent variables GRANGERY test was used. The obtained results from the estimation of the model for selected companies show that in the period of the study there has been a positive significant relationship between operational cash flow, intellectual capital and added value.

Abbasi and Goldi Sedghi (2010) in a research titled "the investigation of the effectiveness of intellectual

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capital elements efficacy on financial performance of companies in Tehran stock exchange" investigated the effectiveness of intellectual capital indicators (physical, human and structural capital efficacy) on financial performance (per share profit, return rate of share holders' salary, and annual return rate) for 99 companies during years 2000-2003. The results of this research showed that the ratio of efficacy of each element of intellectual capital has a positive and significant effect on return rate of shareholders salary. The effectiveness of physical and human capital efficacy ratio on per share profit was positive but negative and significant on the effectiveness of structural capital efficacy ratio. The results also showed that companies with higher intellectual capital have better financial performance and the sum of average ratio of intellectual capital had a meaningful difference among 7 industries.

Another study reveals empirical results that (VAIC™) has positive and significant relation with financial, stock and economic performance of industries. He further concluded that VAIC™ has only significant relation with market performance of high tech Australian Journal of Business and Management industries while they considered that Capital Employed Efficiency (CEE) is key determinant of financial and stock market performance (Zeghal and Maaloul, 2010). Joshi, Cahill and Sidhu (2010) was conducted the study to measure the IC performance through VAIC™ model. They argued that Human Capital Efficiency (HCE) has positive and significant relation to increase the efficiency of Australian Owned banks rather than Structural Capital Efficiency (SCE) and Capital Employed Efficiency (CEE) which means more investment on human capital will increase the more efficiency of banks. Laing, Dunn and Lucas (2010) examined the empirical relation of IC performance and financial performance of hotel industry of Australia over the period of 2004-2007 conducting VAIC™ methodology. They concluded that (ICE) Intellectual Capital Efficiency is based on Human Capital Efficiency (HCE) of hotel industry of Australia which positively encourages financial performance (ROA) of hotel industry (e.g. Rehman *et al.,* 2011).

Definition of intellectual capital

IC was first proposed by Galbraith (1969), as a form of knowledge intellect, and brainpower activity, which uses knowledge to create value.

Any intellectual materials that can create wealth, such as knowledge, information, techniques, intellectual properties, experience, learning ability of organizations, and customer's relationships, can be the most valuable assets and most advantageous tools in competition. Therefore, intellectual capital is generally defines as the combination of capabilities, knowledge's, strategies, processes, intellectual procedures and relational networks of an organization which causes creating values, comparative advantages and achieving organizational goals (e.g. Huu and Fang, 2008).

Components of intellectual capital

Components of intellectual capital consist of human capital, structural capital and external (customer) capital. This classification is admitted in general.

Human Capital

Human capital is defined as the knowledge, skills, experience, intuition and attitudes of the workforce. Intellectual capital can be increased by increasing the capacity of each worker. Human capital is the knowledge, skill and capability of individual employees providing solutions to customers.

Structural (organization) Capital

This consists of a wide range of patents, concepts, models, and computer and administrative systems. These are created by the employees and are thus generally 'owned' by the organization, and adhere to it. Sometimes they can be acquired from elsewhere. Decisions to develop or invest in such assets can be made with some degree of confidence, because the work is done in-house, or bought from outside.

External (customer) Capital

External capital is also named relational capital and customer capital. External - relational capital refers to the organization's relationships or network of associates and their satisfaction with and loyalty to the company. It includes knowledge of market channels, customer and supplier relationships, industry associations and a sound understanding of the impacts of government public policy.

Methodology

To calculate the independent variable, the intellectual capital of the AVIC model is used. Also to calculate the dependent variable, Tobin's Q Ratio and Revenue Growth (GR) are used.

Since the results of this study can be used in financial decision-making process, than it is application of purpose. In terms of methodology, the present study is correlational research group. We used multiple regression models. For testing the significance of multiple

regression models, F Fisher and student t test are used. These two statistical techniques test the significance of general multiple regression and detailed multiple regression Coefficients. If, in the significant level of 95%, observed F value is bigger than critical F value ($F > F_{\alpha(K-1,N-K)}$), H_0 is rejected, but otherwise H_0 is accepted. It is clear that if H_1 is accepted, the regression will be significant (Yaltaji, 1999). Then the EXCEL software is used to summarize the research data. And finally with the help of SPSS software and Eviews 6 research hypothesis will be tested.

Research Hypotheses

First Main hypothesis: The intellectual capital has a significant positive impact on the Tobin's Q Ratio of the Listed Companies on Tehran Stock Exchange.

First Subsidiary hypothesis: Value Added Capital employed Coefficient (VACA) has a significant positive impact on the Tobin's Q Ratio.

Second Subsidiary hypothesis: Value Added Human Capital Coefficient (VAHC) has a significant positive impact on the Tobin's Q Ratio.

Third Subsidiary hypothesis: Value added structural capital coefficient (STVA) has a significant positive impact on the Tobin's Q Ratio.

Second Main hypothesis: The intellectual capital has a significant positive impact on the Revenue Growth (GR) of the Listed Companies on Tehran Stock Exchange.

First Subsidiary hypothesis: Value Added Capital employed Coefficient (VACA) has a significant positive impact on the Revenue Growth (GR).

Second Subsidiary hypothesis: Value Added Human Capital Coefficient (VAHC) has a significant positive impact on the Revenue Growth (GR).

Third Subsidiary hypothesis: Value added structural capital coefficient (STVA) has a significant positive impact on the Revenue Growth (GR).

Data collection method

The final sample of the present study consists of 111 firms of the listed companies on Tehran stock exchange. The selected data cover a period of six years, from 2007 to 2012. All this six periods are the basic knowledge and have a significant importance in the economy of Iran. The method of selected sample was according to Systematic delete methods. The selected companies should have the following characteristics: 1- During the study period, they should not have any changes in the fiscal year. 2- During the research course, they should not make a loss. 3- The information needed to define the variables should be available.

Independent variables: The VAIC methodology developed by Ante Pulic (1998, 2000) forms the underlying measurement basis for the independent variable in the present study. There are four independent variables in this research including: Added value of physical capital (VACA), Added Value of human capital (VAHC), added Value capital structure (STVA), Value Added Intellectual Coefficient (VAIC™).

$VAIC_{TM}$ of a firm is calculated using the following five steps:

Step- 1 Value added can be calculated by the following formula:

VA = OP +EC + D + A

Where, OP is operating profits, EC employee costs (the salaries and the social expenses of staff) and D and A, depreciation and amortization of assets, respectively.

Step- 2 The calculation of Value Added Capital employed Coefficient ($VACA_{it}$)

$VACA_{it}$ / VA_{it} / CA_{it}

Where, CA_{it} = Capital Employed = Physical Assets + Financial Assets = Total Assets - Intangible Assets at the end of 't' period

$VACA_{it}$ = the value created by one unit of capital employed during the 't' period

Step- 3 Calculation of Value Added Human Capital Coefficient ($VAHC_{it}$)

Human Capital (HC): Overall employee expenses (salaries, education, and training); in this analysis considered an investment, not cost, and thus not substantial part of INPUT any more. Therefore:

$VAHC_{it} = VA_{it} / HC_{it}$

Where, HC_{it} = investment in Human Capital during the 't' period or total salary and wage including all incentives

$VAHC_{it}$ = Value added by one unit of Human Capital invested during period of 't'

Step- 4 Calculation of the value added structural capital coefficient ($STVA_{it}$)

Structural Capital (SC): Result of Human Capital's past performance (organization, licenses, patents, image, standards, and relationship with customers). Therefore:

$STVA_{it} = SC_{it} / VA_{it}$

Where, SC_{it} = Structural capital ($VA_{it} - HC_{it}$)

$STVA_{it}$ = the proportion of total VA accounted by structural capital.

Step- 5 Calculation of Value Added Intellectual Coefficient ($VAIC_{it}$)

$VAIC_{it} = VAHC_{it} + VACA_{it} + STVA_{it}$

Where, $VAIC_{it}$ = Indicate corporate value creation efficiency on firm resources.

Dependent variables: The dependent variables in this research are Tobin Q (Q) and revenue growth (GR). Method to calculate dependent variables are presented below:

*Q Ratio (Tobin's Q Ratio):*A ratio devised by James Tobin of Yale University, Nobel laureate in economics, who hypothesized that the combined market value of all the companies on the stock market should be equal to their replacement costs. The Q ratio is calculated as the market value of a company divided by the replacement value of the firm's assets

$$Q = \frac{\text{Value of Stack Market} + \text{Liabilities Book Value}}{BV_{TA}}$$

Where: BVTA = Total net Asset Book Value = = Net book value of equity (http://www.investopedia.com)

Revenue Growth (GR): Revenue growth illustrates sales increases/decreases over time. It is used to measure how fast a business is expanding. More valuable than a snapshot of revenue, revenue growth helps investors identify trends in order to gauge revenue growth over time. Or Revenue Growth is the percent increase (or decrease) in a company's revenue between two or more equivalent fiscal periods.

$$GR = \left[\left(\frac{\text{current years revenues}}{\text{last years revenues}}\right) - 1\right] * 100\%$$

Results

Descriptive Statistics

In order to analyze the data, descriptive statistics of the data is calculated. Table 1 shows the descriptive statistics for each variable separately indicate the amount to be descriptive parameters including information related to the maximum, minimum, average and median. The second category includes parameters such as dispersion, variance, Skewness and *Kurtosis* which is indicated data dispersion around the average. Results of descriptive statistics to analyze the data are presented in table 1.

Table 1. Descriptive statistics of variables during the period 201*2*-2007 and 3630 observed (Millions of IRR)

Variables	VACA	VAHC	STVA	VACI	Q	GR
Mean	0.30340	15.3372	0.8356	17.449	3.223	0.658
Median	0.21000	8.62500	0.8900	9.9750	1.290	0.160
Maximum	8.71000	138.460	1.6000	202.00	217.2	171.22
Minimum	-0.0200	-1.6600	-0.050	-0.0700	0.410	-1.000
Std. Dev.	0.4512	18.675	0.1650	21.4648	9.861	7.123
Skewness	10.920	2.6448	-1.244	3.19366	16.30	21.61
Kurtosis	185.85	11.220	5.7702	17.3218	338.86	502.86
Jarque-Bera	941093	2651.91	384.96	6824.11	3159810.	6985569.
P value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sum Sq. Dev.	135.4146	231932.4	18.109	30632.9	64671.7	33745.2
Observations	666	666	666	666	666	666

First hypothesis Testing

To analyze data and test hypothesis I (major hypothesis and three other minor hypothesis), the impact of intellectual capital on the *Q* Tobin index, multiple Regression models (1) and (2) are usable.

$$Q_{it} = d_0 + d_1 VAIC_{it} + e_{it} \quad (1)$$

$$Q_{it} = d_0 + d_1 VACA_{it} + d_2 VAHU_{it} + d_3 STVA_{it} + e_{it} \quad (2)$$

To choose between pool data and panel data we can use F limer test. Since the P-value of F limer is (0.0003) and it is less than 5% (p-value≤ 0.05), the Null hypothesis is rejected, and method of panel data is accepted. Panel data method is divided into two minor parts: fixed effects method and random effects method. To decide about which method to choose, we used Hausman test. Since the p-value of Hausman test is (0.0082) and (P-value <0.05) the Null hypothesis is rejected. So the fixed effects method is accepted. Results of this test are presented in table 2.

Table 2. The results F Lymr and Hausman

Test F Lymr		Hausman test	
(0.0003)	1.633280	(0.0082)	13.738993

A result of data analysis using the models (1) and (2) in Table (3) is reflected.

Table 3. The results of data analysis to test the hypothesis by using panel data

Dependent variable: indicator Q Tobin (Q) Number of observations for each variable 666,					
Variables	**Coefficient**	**The standard error**	**Statistics t**	**p-value**	**Hadri Test**
VACA	0.011475	0.542610	0.021149	0.9831	-2.60904 0.9955
VAHC	-0.02154	0.008306	-2.594062	0.0098	2.06164 0.0196
STVA	5.210724	0.825511	6.312120	0.0000	0.00273 0.4989
VAIC	-0.00720	0.007729	-0.932272	0.3517	-0.52557 0.7004
C	-0.35914	0.654870	-0.548416	0.5837	-
AR (1)	-0.28924	0.044923	-6.438556	0.0000	-
Q	-	-	-	-	-3.53696 0.9998
R^2	0.23800	Test Durbin - Watson		1.196584	
Test F of Fisher	1.77122	p-value		0.000	

The results of data analysis related to test of first hypothesis presented in table 3 are interpreted as follows:

A) With the consideration of observed F value and critical F value for total regression is 0.0000, which is lower than 5% (p-value<0.05), null Hypothesis is rejected and it means that all of coefficients are not zero simultaneously. Therefore, there is a significant relationship between the dependent and independent variables simultaneously.

B) Comparing observed t with critical t, and considering p value related to all the coefficients, we can conclude that the null hypotheses related to STVA - VAHU are rejected at *0*.05 level of significance. However, the null hypotheses related to VACA - VAIC are accepted at the same level of significance. Therefore, among those four independent variables, only structure capital, human capital has a positive significant relationship with Q.

C) The observed statistic of Durbin- Watson, it was found that model correlation is recognizable.

D) P-value of Hadri test for all variables is more than expected errors (p-value>0.05), so all the variables are persistent.

E) R^2 obtained shows the model independent variables (value added structure capital and value added human capital) are able to justify *23%* Relation of the dependent variable.

The suited regression equation is as follows:

$$Q_{it} = -0.35 - 0.007\,VAIC_{it} + e_{it} \quad (3)$$

$$Q_{it} = -0.35 + 0.01VACA_i - 0.02\,VAHC_{it} + 5.21\,STVA_{it} + e_{it} \quad (4)$$

Second hypothesis Testing

To analyze data and test the second hypothesis (The major Hypothesis and Three minor Hypotheses), the impact of intellectual capital on the Revenue growth rate *(*GR), from multiple regressions models (5) and (6) are used.

$$GR_{it} = j_0 + j_1\,VAIC_{it} + e_{it} \quad (5)$$

$$GR_{it} = j_0 + j_1\,VAIC_{it} + j_2 VAHU_{it} + j_3 STVA_{it} + e_{it} \quad (6)$$

To choose between pool data and panel data we can use F limer test. Since the P-value of F limer is (0.0000) and less than 5% (p-*value* ≤ *0.05*), the Null hypothesis is rejected, and method of panel data is accepted. Panel data method is divided into two minor parts: fixed effects method and random effects method. To decide about which method to choose, we used Hausman test. Since the result of p-value of Hausman test is (0.0001) and (P-value <0.05) the Null hypothesis is rejected. So the fixed effects method is accepted. Results of this test are presented in table 4.

Table 4. Test Results F Lymr and Hausman

Test F Lymr		**Hausman test**	
(0.000)	2.673131	(0.0001)	24.324615

The results of data analysis models (5) and (6) in Table (5) are reflected.

The results of data analysis related to test of second hypothesis presented in table 5 are interpreted as follows:

A) With the consideration of observed F value and critical F value for total regression is 0.0000, which is lower than 5% (p-value<0.05), null Hypothesis is rejected and it means that all of coefficients are not zero simultaneously. Therefore, there is a significant relationship between the dependent and independent variables simultaneously.

Table 5. Results of data analysis to test the hypothesis using panel data

Dependent variable: Growth Index (GR) Number of observations for each variable: 666					
Variables	**Coefficient**	**The standard error**	**Statistics t**	**p-value**	**Hadri Test**
VACA	2.419133	0.206516	11.71400	0.0000	-2.60904 0.9955
VAHC	-0.000564	0.000963	-0.585363	0.5585	2.06164 0.0196
STVA	1.885467	0.170793	11.03946	0.0000	0.00273 0.4989
VAIC	0.003898	0.000935	-4.171085	0.0000	-0.52557 0.7004
C	-1.574592	0.151071	-10.42283	0.0000	-
GR	-	-	-	-	6.63813 0.0000
R^2	0.288445	Test Durbin - Watson		2.148879	
Test F of Fisher	3.364674	p-value		0.000	

B) Comparing observed t with critical t, and considering p value related to all the coefficients, we can conclude that the null hypotheses related to STVA-VACA - VAIC are rejected at 0.05 level of significance. However, the null hypothesis related to VAHU is accepted at the same level of significance. So there are positive significant relationship between STVA, VACA and VAIC with GR.

C) The observed statistic of Durbin- Watson revealed that the model does not have self-correlation.

D) P-value of Hadri test for all variables is more than expected errors (p-value>0.05), so all the variables are persistent.

E) R^2 obtained shows the model independent variables (value added structure capital and value added physical capital and value added intellectual capital) are able to justify *28%* relation of the dependent variable.

Then we can conclude that there are positive significant relationships between STVA, VACA and VAIC with GR in 95% of matters .But between values added human capital (VAHC) with GR there is no significant relation in 95% of matters.

The suited regression equation is as follows:

$$CR_{it} = -1.57 - 0.003\ VAIC_{it} + e_{it} \quad (7)$$

$$CR_{it} = -1.57 + 2.41 VACA_{it} - 0.0005 VAHC_{it} + 1.88\ STVA_{it} + e_{it} \quad (8)$$

Conclusions

First hypothesis: The results of this test confirmed that there is no significant relationship between intellectual capital and Q_{Tobin}. Also according to the p-value the three sub-hypothesis, the null hypothesis is rejected for second and third minor hypostasis, therefore there are significant relationship between human and structure capital to Q_{Tobin}, but to human capital is negative and structure capital is positive. (Second and third sub-hypothesis are accepted, and the first sub-hypothesis is rejected).

Second hypothesis: The dependent variable Revenue growth (GR) as index of performance, the results of this research showed that there is a negative significant relationship between intellectual capital and GR of companies. Also according to the p-value the three sub-hypothesis, the null hypothesis is rejected for first and third sub-hypothesis, so there are positive and significant relationship between physical and structure capital to GR. (First and third sub-hypothesis are confirmed, and the second sub-hypothesis is rejected).

Suggestions

1- Suggestion is to the Stock Exchange, with the development of appropriate indicators and appropriate to the circumstances and capacities of the national economy can take action Classification of companies listed on the stock exchange of intellectual capital perspective.

2- The Tehran Stock Exchange as proposed to be custodian of capital markets, companies persuade to report the number of variables related to intellectual capital and intangible assets presented in the financial statements of the company or a supplementary report to users from Information to more easily is able to use these variables in your decision.

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